

# Epidemiology of Child Malnutrition in Colombia

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## ABSTRACT

Child malnutrition is defined as that condition associated with a deficient intake of nutrients, which may be secondary to poor diet or assimilation of these which interfere with the proper functioning of the organism. The globally accepted anthropometric parameters for measuring nutritional status are: weight for height, weight for age, height for age; which must be below 2 standard deviations. Child malnutrition is the consequence of multiple causes, including physical, psychosocial, economic, political, and cultural factors, over which food insecurity, low schooling, and access to basic sanitation prevail. Malnutrition is an important cause of infant morbidity and mortality

**KEYWORDS:** Malnutrition; Child malnutrition; Colombia; Emaciation; Thinness; Underweight

## INTRODUCTION

Malnutrition is defined as a condition produced as a consequence of a nutrient deficit which may be secondary to a poor diet or an inadequate assimilation of food that causes failures in the proper functioning of the organism [1,2]. Malnutrition has as a consequence the deterioration of body composition and alteration of the functions of the organs, additionally it can affect the psychosocial environment of the patient from factors related to

the time of onset of the deficit and the diet that may be needed for nutrient restoration. Due to this, it is possible to classify malnutrition from several approaches:

a) Primary malnutrition: It consists of an insufficient and incomplete administration according to the needs of the individual, so that the necessary or adequate quantity or quality of food is not received [3,4].

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b) Secondary malnutrition: It occurs when there are pathophysiological alterations that prevent the digestion, absorption or use of nutrients.

c) Mixed malnutrition: It is a combination of inadequate food intake in quantity and quality, added to a problem in the intake, absorption and use of food.

Regarding anthropometric parameters, the most accepted as indicators of growth are: weight for age, height for age, weight for height and body mass index for age, through which it is considered that it is possible to carry out an evaluation of the nutritional and health status of children [5,6] so that malnutrition can be classified as follows:

a) **Acute malnutrition:** Weight loss as a result of famine or disease which develops rapidly. Anthropometrically, a low weight for height (W/TP -2 SD) is evidenced and is known as extreme thinness or emaciation. This can be further subdivided into:

I. **Moderate acute malnutrition:** P/TP -2 and -3 DE

II. **Severe acute malnutrition:** P/TP - 3 SD or when there is bilateral edema and/or anasarca

b) **Chronic malnutrition:** It is the result of factors such as food insecurity, maternal malnutrition, inadequate nutrition, repeated infections, as well as psychosocial actors, such as the mother's low level of education, insufficient care, poor parenting practices, lack of access to basic sanitation, among other factors. that act together for prolonged periods of weight; Consequently, a delay in height for age (T/EP -2 SD) occurs, known as growth retardation.

I. **Global malnutrition:** It is the lack of weight for age, also known as underweight (W/EP -2 SD).

II. **Malnutrition due to micronutrient deficiency:** Includes deficiencies or excesses of vitamins and minerals.

In addition to the previously mentioned classifications, it is possible to phenotypically classify severe acute malnutrition as follows:

a) **Kwashiorkor:** This is presented as a manifestation of protein deprivation that exceeds the reduction in caloric intake, it is the severe acute form of protein-energy malnutrition. It is common in patients who have been breastfed for a long time and in areas where protein sources are difficult to access, associated with this there is an excess intake of carbohydrates. It usually occurs in children under 1 year of age. It is characterized by both local and generalized edema, apathy, asthenia, adynamia, reduced muscle mass, and fatty infiltration of the liver. In particular, the "flag sign" may occur, which consists of a change in hair texture, as well as dermatitis in friction areas (Table 1). It is common for it to be associated with micronutrient deficiencies such as vitamin A and B complex.

b) **Marasmus:** Contrary to Kwashiorkor, this is characterized by a lack of food in general and secondarily energy. Like the previous one, it occurs predominantly in the first year of life and is associated with infectious diseases, mental deficiency, malabsorption syndrome, premature birth and early interruption of breastfeeding. The manifestations of this type of malnutrition are in general: poor growth, very low weight, emaciation, very thin extremities, little muscle mass and subcutaneous fat, asthenia, adynamia, diarrhea, changes in the skin, hair, and dehydration (Table 1).

**Table 1:** Manifestations by body segment of severe acute malnutrition.

Body Segment	Marasmus	Kwashiorkor
Expensive	Livid, Thin	Moon fascies
Eyes	Dry, Pale conjunctiva, Bitot's spots	Dry, Pale conjunctiva, Bitot's spots
Mouth	Angular stomatitis, Cheilitis, Glossitis, Hypertrophic and Bleeding gums	Angular stomatitis, Cheilitis, Glossitis, Hypertrophic and Bleeding gums
Teeth	Mottled enamel, Late eruption	Mottled Enamel, Late Eruption
Hair	Hair Atrophy	Depigmented, Fine, Dull, Dry, Brittle, Alopecia, Bands of color
Skin	Dry, Foldable	Dry with diffuse hyper or hypopigmentation, Pellagroid Dermatitis, Intertriginous Lesions, Scrotal and Vulvar dermatosis
Nail	Koilonychia, Thin, Soft nails, Lines	Koilonychia, Thin, Soft nails, Lines
Weight loss	Checked	Unreliable weight due to the presence of edema
Muscular system	Generalized muscular hypotrophy or atrophy	Muscle hypotrophy
Edema	No edema	Always have edema
Adipose Panicle	Absent	Present but scarce
Abdomen	Decreased bowel sounds	Hepatomegaly, Steatosis
Neurological	Irritable, Global developmental delay, Loss of patellar and Heel reflexes	Dynamia, Listlessness, Irritability, Sadness, Global developmental delay, Loss of patellar and Heel reflexes
Hematological	Pallor, Petechiae	Pallor, Petechiae

**c) Mixed:** Known as marasmatic Kwashiorkor, which includes children with severe malnutrition, edema and a weight below 60% of the P/E indicator. Due to the health problems and risk of death associated with malnutrition, this is considered a threat to the survival and health of children since the WHO considered that around 1/3 of infant mortality was associated with malnutrition. It has been identified that at least 200 million children in the world are malnourished, of which 13% are classified as acute malnutrition and 5% as severe acute malnutrition. Additionally, 23% of children under 5 years of age have delayed growth. In Colombia, the malnutrition rate in this population was 12.7%, being higher than the average in the Latin American region, which is 10%; Despite this, it is considered that the trend of malnutrition in Colombia has a decreasing trend in recent decades. Also, It was estimated that in Colombia in a period of 5 years, 57,119 children died, of which it is considered that 45% of deaths were associated or attributable to malnutrition and the functional and immunological alterations resulting from it. It has been identified that most nutritional alterations are not unicausal but rather a consequence of the confluence of social, economic, cultural, nutritional and psychosocial factors.

Among the associated factors, it has been possible to identify that the level of maternal education, underdevelopment, displacement conditions, food insecurity are risk factors for child malnutrition [7]. Despite the fact that rural areas are where food is produced, they are the ones that are most food insecure [8]. Another important factor when talking about child malnutrition in the Colombian context is the presence of ethnic communities, which live in regions far from each other and far from health care centers; In these communities, multiparity increases the risk of forced weaning, competition for nutrition and inadequate complementary feeding, accumulating factors that influence food insecurity in the region [9-11]. Because the confluence of these factors increases the risk of child malnutrition, the importance of knowing the epidemiology of this disease arises, in order to establish in the Colombian context all those areas in which future actions and interventions should be implemented.

## METHODOLOGY

For the design of this study, a systematic review was carried out in different search engines such as Google Scholar, Pubmed, Scielo, Elsevier, Science Direct; Additionally, the databases of government institutions such as the WHO, Colombian Ministry of Health, and UNICEF were consulted. The search was carried out taking into account the keywords "child malnutrition", "malnutrition in Colombia", "epidemiology" and "malnutrition". A total of 31 articles in English and Spanish located in the region of Colombia in the period greater than the year 2011 were selected, which allowed identifying the epidemiology associated with malnutrition in the country. Articles that did not meet the aforementioned criteria and which do not address the topic to be treated were excluded from the review.

## RESULTS AND DISCUSSION

The rate of child malnutrition in children under 5 years of age in the world reaches approximately 200 million children, of which 13% correspond to acute malnutrition and 5% to severe acute malnutrition, with approximately 23% of them suffering from delay in increase; In addition, in the study carried out by Machado et al. [7] report a growth retardation rate of 30% and acute malnutrition

of 18%. This differs from what was reported by Marrugo et al. [11] who established that in 2010 chronic malnutrition in children under 5 years of age was 13.2%. In Colombia, for the year 2010, the rate of delay in development was 12.7%, according to what was reported by Osorio et al. [12], however, for the year 2015, 10.8% of children are stunted, 1.6% acute malnutrition and 3.1% global malnutrition. Additionally, it was evidenced that the delay in height for age was 23%.

At the local level, in different cities of the country, higher than average rates are reported, as is the case of Pereira, which reports a general malnutrition rate of 24.7%, which is supported by the study by Machado Duque et al. [7] who report a rate of 23%; In other regions, such as San Andrés and Vaupés, chronic malnutrition rates between 3.8% and 34.7%, respectively, are reported, while in the department of Antioquia, a prevalence of chronic malnutrition of 17.4% was reported. However, in the study "The dual burden of malnutrition in Colombia" they commented on a rate of 13.2%. In the capital of the country, a prevalence of 13% was reported, similar to the department of Antioquia [13,14].

As for the distribution by areas, the study "The social determinants of child malnutrition in Colombia seen from family medicine" reports that in 2014 the prevalence of malnutrition was higher in rural areas, reaching up to 1 in 10 children, however, it was evidenced that global malnutrition rates were higher in the urban area, reaching 22.1% versus the 20.8% described in the rural area. While Forero [15] explains that residence in rural areas doubles the prevalence of chronic malnutrition and developmental delay compared to urban areas, being 4.7% compared to 2.9%. In accordance with the first approach, Agudelo [3] agrees that at least half of the nutritional alterations occur in rural areas, while Sanson-Rosas et al. [8] show in their study that in rural areas there is a greater coexistence of overweight mothers and malnourished children, exceeding the national prevalence [16]. In the study by Neufeld et al. [17] also evidenced a higher prevalence of micronutrient deficiencies in the rural population stating that it is possible to explain these findings, because in rural areas there is difficult access to services, drinking water, increased risk of infections, higher rates of food insecurity and poverty.

According to the studies carried out, food insecurity is a factor with a significant impact on child malnutrition rates, since it is estimated that in 2009 approximately 62% of the community went through this situation, suffering from hunger and not having the means cheap to mitigate it. According to Samson-Rosas et al. [8] "household food insecurity occurs when there are concerns about access to available food; the food necessary for a healthy life is insufficient or when access to food implies unacceptable practices". In surveys carried out in 2015, it was established that 64% of rural households in Colombia experience food insecurity and in urban regions an estimated 52%. These figures are lower than those reported by Russell et al. [9] who found that for this same period, 77% of indigenous households reached 77%. According to Osorio et al. [12] the richest communities have greater access to food in quality and quantity, for which the levels of poverty in the region increase the risk of suffering from food insecurity, in addition to the decrease in diverse and nutritious foods, replacing them with those rich in energy. This same study showed that the level of wealth is the only statistically significant variable that influences the probability that a child suffers from chronic malnutrition, due to the association with determinants such as access to drinking

water, sanitation services and education. The richest communities have greater access to food in quality and quantity, for which the levels of poverty in the region increase the risk of suffering from food insecurity, in addition to the decrease in diverse and nutritious foods, replacing them with those rich in energy.

As far as education is concerned, multiple studies support the finding that a good educational level improves knowledge about nutrition, skills and attitudes to guide and control health situations. Osorio et al. [12] show that, in communities with malnourished children, mothers had an average of 8 years of education, however, more than half of the fathers do not exceed primary school; They also identified that more than the level of formal schooling, the mother's capacity for decision-making and autonomy was a predictor for nutritional status in childhood. According to Neufeld [17] the prevalence of short stature in children whose mothers have no formal education was 31.3%, 11.7% in those who studied high school and 8% in those who finished higher education while in the study by Arias et al. [10] found similar findings to this, there is a higher prevalence among women without education compared to those with higher education [18]. Garcia et al. [19] indicate that the children of mothers with a low educational level are at greater risk of delayed growth, due to worsening health behaviors and poorer care practices, as well as worse living conditions. In addition, it is evident that the educational level influences knowledge about good eating practices, health and prevention and attention to diseases. This knowledge about adequate nutrition practices has been of great importance, since it is established that the abandonment of breastfeeding before 6 months, the use of milk substitutes, and the inclusion of other foods early exposes infants to children to an inadequate intake of nutrients to meet their physiological needs. In Colombia, the national average of breastfeeding is 96% with an approximate duration of 12.9 months, however, in displaced populations this figure was significantly lower, reaching 9.4 months. There are regions such as Guajira where only 21% of children received breastfeeding in the first 6 months, compared to the indigenous population where breastfeeding reached 49% of children.

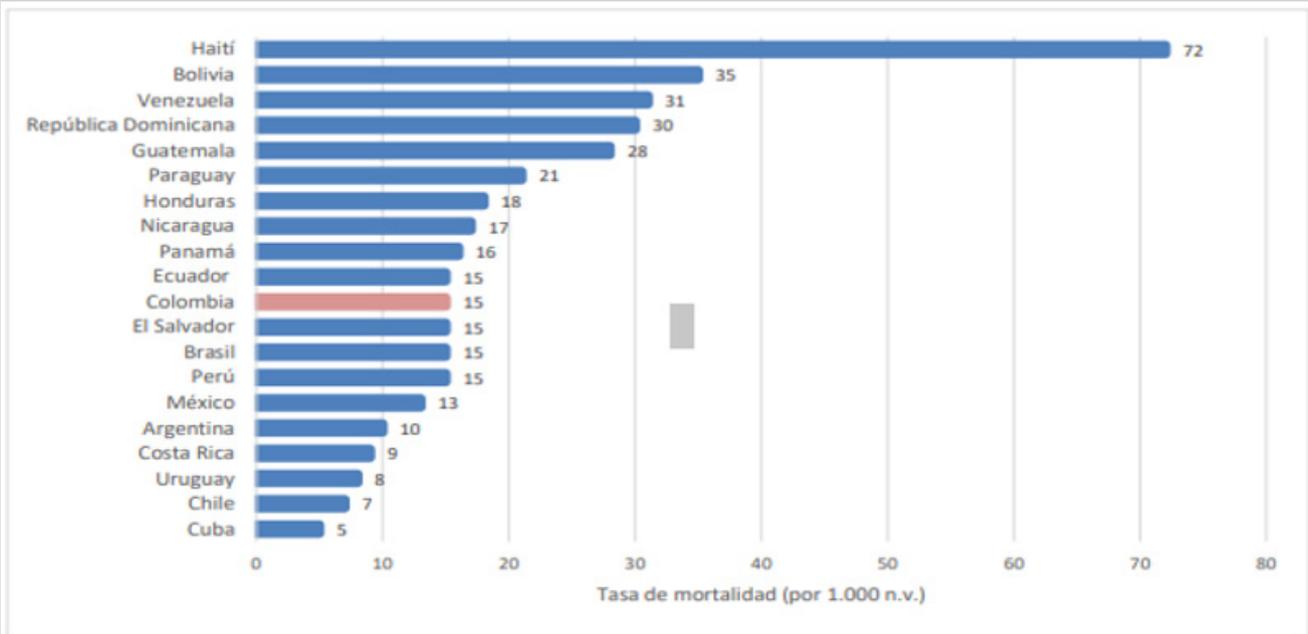
In a study carried out in Bogotá, interventions were carried out to promote breastfeeding, increasing up to 73% in children who are effectively breastfed, changing their nutritional status from chronic malnutrition to adequate height for age [20]. Likewise, it was evidenced that the regions with the highest prevalence of exclusive breastfeeding were Bogotá, Orinoquia, Amazonia, and the Pacific region, with prevalences ranging between 40% and 46%; despite this, in the regions in which it lasts up to one year of life are the Southwest of the country, meta, San Andrés and Providencia, Vaupés and Arauca, reaching figures of up to 75%, [21]. It is considered that breastfeeding has all the necessary nutrients in quality and quantity for every human being.

Some aspects such as the limited economic resources of the family and the community create difficulties in accessing the food necessary to meet the nutritional needs of children. Approximately 31.1% of children live in poor or very poor homes and in those regions considered rich there is a high degree of social inequality; This, according to Agudelo [3], results in limited consumption and low availability of food, since as a particular finding of Machado-Duque et al. [7] evidenced an association between food insecurity and the need to divide food due to reduced economic capacity; Likewise, it was established that in Colombia, where there are high rates of poverty, there are lower rates of overweight and

malnutrition prevails [22-24]. In rural areas, the availability of food is dependent on local production, which is why factors such as mining and the inclusion of groups outside the law also limit their availability. According to the Public Health Surveillance Protocol in Colombia, approximately 20 million people do not have access to the basic products of the family basket and the study "Nutritional level and status in children and adolescents in Bogotá, Colombia. FUPRECOL study" identified that at least 40% do not receive food during breakfast, which contrasted with a previous study referred to in the same where approximately 14.2% did not eat breakfast, for which reason this information should be interpreted with reservation [25]. All these associated factors encourage children, when receiving complementary feeding, not to eat enough, varied and nutritious foods, but those rich in fats and carbohydrates that provide a barely sufficient caloric intake [26], therefore, in Colombia the prevalence of malnutrition it rises in the second half of the 1 year of life [27]. Additionally, poverty is not only associated with food deficiency, but is also associated with deficient basic sanitation and lack of drinking water in the communities, which also generates a great burden of disease for the population. in Colombia the prevalence of malnutrition rises in the second semester of 1 year of life. Additionally, poverty is not only associated with food deficiency, but is also associated with deficient basic sanitation and lack of drinking water in the communities, which also generates a great burden of disease for the population. in Colombia the prevalence of malnutrition rises in the second semester of 1 year of life. Additionally, poverty is not only associated with food deficiency, but is also associated with deficient basic sanitation and lack of drinking water in the communities, which also generates a great burden of disease for the population.

In countries like Colombia, the water supply through aqueduct is one of the most affected by poverty, as well as the sewage system and the sanitary service; the deficiency of these generates a vehicle for the transport of microorganisms and stagnant water acts as a reservoir for different agents, secondarily increases the risk of infectious diseases, diarrhea, among others that increase malnutrition [28]. It is estimated that approximately 85% of the Cuban population has access to drinking water and 79% to basic sanitation [2,19,29], therefore it is inferred that the inhabitants of rural areas are exposed to environmental risks. Osorio et al. [17] establish that the richest communities have better physical structure and services.

In addition to the alterations generated by malnutrition itself, an increased risk of suffering from other diseases such as anemia, diarrhea, and respiratory infections has been associated with it. Regarding infant mortality, this is defined as any death of a boy or girl under 5 years of age. In Colombia it is estimated that in a period of 5 years 57,119 children die; of all child deaths in the country, it was estimated that around 45% of them are associated or attributable to malnutrition, however, when recording the basic cause of death, this is done by reporting the last organ or system that presented failures, without taking into account diseases as a consequence of malnutrition. According to figures from DANE, severely malnourished children have a higher risk of death, especially due to infectious diseases, reaching 8.4%, which increases as malnutrition progresses from mild to severe. According to the INS, nutritional deficiencies in children under 4 years of age correspond to 14% of mortality, and associated with this, it was also established that 13.6% of mortality was due to respiratory infections and 11% due to gastrointestinal infections (Figure 1).

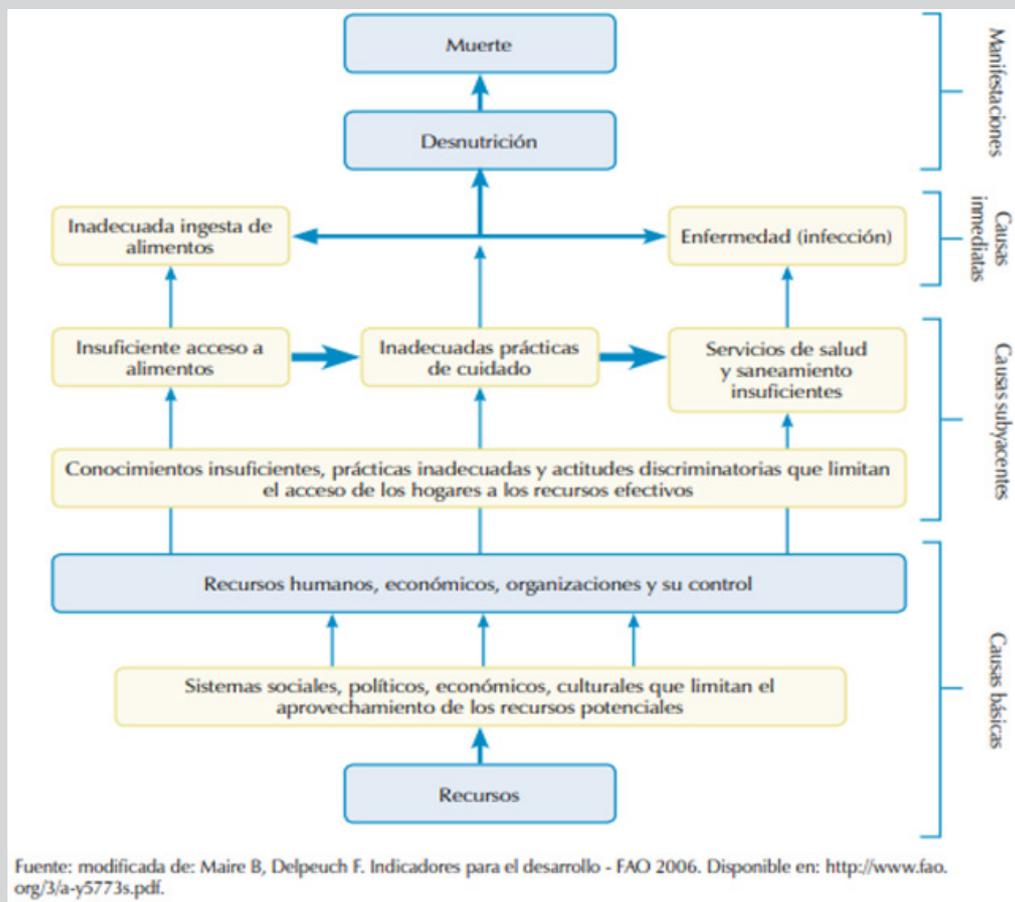


Elaboración propia – datos tomados de Banco Mundial (2017).

Figure 1: Mortality in children under 5 years of age.

Based on the aforementioned, it is possible to identify that malnutrition is a multifactorial problem, in which immediate causes, underlying causes and basic causes participate, as can be

seen in Figure 2, which is necessary to intervene to achieve an impact on this problem in Health [30].



Fuente: modificada de: Maire B, Delpeuch F. Indicadores para el desarrollo - FAO 2006. Disponible en: <http://www.fao.org/3/a-y5773s.pdf>.

Figure 2: Causes of malnutrition.

## CONCLUSION

Child malnutrition, despite not being a disease of public health interest worldwide, currently continues to generate high morbidity and mortality in developing countries such as Colombia. The different authors agree that it is a multi-causal and diverse disorder, in which it is possible to identify economic inequality, food insecurity, low educational levels and poor access to basic sanitation as the main determining factors. Despite the fact that malnutrition figures have decreased, infant mortality, either directly associated with malnutrition or attributable to it, continues to be a problem that requires intervention and attention from government, health, and community entities; Additionally, it was evidenced that mortality due to malnutrition is underreported, since the diseases attributable to it are reported as an isolated entity and not as the consequence of a series of changes triggered by the state of malnutrition.

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